

pairs of buccal ganglions; *g*, ditto uniting upper buccal ganglions to anterior subœsophageal; *h*, ditto uniting upper buccal ganglions to optic ditto; *i*, optic ganglions; *j*, optic nerves; *k*, enlargement of same at back of eye; *l*, small round ganglion attached to optic nerve; *m*, two pairs of nerves from same; *n*, visceral ganglion; *o*, branchial ditto; *p, p*, cords or commissures from same to stellate ganglions; *q*, visceral nerves; *q', q'*, nerves to the mantle; *r*, pair of visceral nerves applied to intestine, and tube of ink-bag; *s*, small ganglion at origin of this pair of nerves; *t*, another pair of visceral nerves supplying the anterior vena cava; *u*, ganglion on the wall of vena cava; *v, v*, branchial nerves, each exhibiting a ganglionic swelling *v'*; *w, w*, genital nerves; *x*, nerve supplying systemic and branchial hearts and posterior aorta; *y*, cord or commissure uniting gastric ganglion to that on vena cava; *z*, gastric ganglion; A, nerve to spiral stomach; B, B, B, nerves to gizzard; C, C, ditto to pancreatic organ; D, ditto to pylorus; E, ditto to cardia; F, F, œsophageal nerves or par vagum.

**Fig. 2.** Under view of anterior subœsophageal and optic ganglions:—*a*, anterior mass; *b*, under commissure connecting same to median; *c, c*, upper ditto; *d*, upper buccal ganglions; *e, e*, nerves supplying the outer buccal capsule; *f*, commissure between same and lower buccal ganglions; *g*, commissure from upper buccal ganglions to anterior subœsophageal mass; *h*, ditto from optic to upper buccal ganglions; *i*, optic ganglions; *j, j*, optic nerves; *l, l*, small round ganglions on same; *m, m*, brachial nerves; *n*, two pairs of nerves to muscles in front of eyes.

**Fig. 3.** Upper view of optic ganglions:—*i*, optic ganglions; *j, j*, optic nerves; *k, k*, enlargement of same at back of eye; *l*, small round ganglions on optic nerves; *m, m*, nerves from same to skin of head above and behind; *n, n*, filaments from optic nerve applied to back of eye; *o*, eye.

**Fig. 4.** Otolithe from auditory sac.

II.—*A few Notes on the Structure of the Belemnite.* By GIDEON ALGERNON MANTELL, Esq., LL.D., F.R.S., President of the West London Medical Society, &c.

*To the Editors of the Annals of Natural History.*

“Dr. Mantell, who has adopted Mr. Channing Pearce’s generic name of *Belemnoteuthis* for some of these fossils (*Belemnites*), seems to be disposed to detract from the merit of their anatomical restoration, for which the Royal Society awarded the Royal Medal to Professor Owen in 1848, affirming that the true characters of the animal of the Belemnite have yet to be discovered. But he forgets that a change of name does not change the essence of a thing, and that the essential character of a Belemnite is the *phragmocone*.”—From the Article entitled “Progress of Comparative Anatomy,” Quarterly Review, March 1852, p. 383.

GENTLEMEN,

THE personal imputation, the mystification of the point at issue, and the misstatement respecting the late Mr. Channing Pearce,

in the above extract from the extraordinary article misnamed "The Progress of Comparative Anatomy," would not have provoked one line from my pen, but for the assertion that "the essential character of a Belemnite is the phragmocone." As the advancement of our knowledge of the organization of the extinct forms of Cephalopods would be seriously impeded were a statement so erroneous, and emanating from such high authority, to remain uncontradicted, I beg the favour of being permitted to lay before your readers a concise illustration of such parts of the structure of those two distinct types of the highest order of Mollusca—the Belemnite and *Belemnoteuthis*—which were blended together to form the supposed animal of the Belemnite in the memoir above referred to.

The accompanying sketches represent certain fossils from the Oxford clay of Wiltshire, in which the distinctive characters of the two genera are clearly exemplified: the original specimens were examined by many of the eminent foreign naturalists who were attracted to London last summer by the Great Exhibition, and not one of those competent observers dissented from the opinions expressed in my communications on this subject to the Royal Society, and published in the 'Philos. Trans.' for 1848 and 1850; my statement being merely confirmatory of the original views enunciated by Messrs. Pearce, Cunnington, Charlesworth, &c.

I am most anxious, as I have ever been, to abstain from any comments that may lead to controversy, and I therefore restrict myself to a simple description of the specimens, of which figs. 1 and 3 are representations on a reduced scale: the originals in my possession may be seen by any naturalist interested in the inquiry: those in the British Museum are now admirably arranged by the able curator Mr. Woodward\*. It is however necessary to state most emphatically, that the essential character of a Belemnite consists, not, as the reviewer affirms, in the possession of a "phragmocone" or conical chambered siphunculated shell, which is common to numerous genera of Cephalopods, but of an osselet of a peculiar form and structure which invested the phragmocone, and extended distally beyond the chambered shell in a solid rostrum or guard. It is this mineralized rostrum which was called *Belemnite*, thunderbolt, or dart-stone, by the early naturalists.

\* See my 'Hand-book to the Gallery of Organic Remains in the British Museum.' The characters of the fossil Cephalopods are succinctly and clearly pointed out in Mr. Woodward's excellent 'Manual of the Mollusca.'

The BELEMNITE.—In the specimen represented (fig. 1), and in the diagram fig. 2, all the known parts of the structure of the Belemnite are displayed: but slight traces of any portion of the organization of the original are preserved, except the sepio-staire, which comprises an external horny capsule, a calcareous osselet of a fibrous structure, and an internal chambered conical shell, termed the phragmocone.

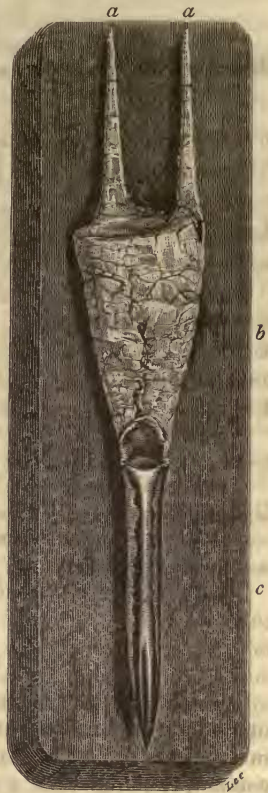
1. *The Phragmocone* (fig. 1 *b*, fig. 2 *d*) occupies the centre of the Belemnite: this is an inversely conical-chambered shell, composed of a series of shallow concave cells of a nacreous substance, traversed by a siphunculus or tube (fig. 2 *c*), which is situated on the ventral region of the cone. The phragmocone terminates distally in an elongated apex, and enlarges towards its basilar part, and two elongated flat processes extend from the dorsal margin of the peristome or upper margin, as shown in figs. 1 & 2 *a, a*: this structure was first detected in a specimen discovered by my son near Trowbridge.

The shape of the phragmocone, as it appears when exposed by the removal of the part next to be described, is seen in fig. 2 *d*: the transverse lines indicate the septa of the cells or chambers; the siphunculus which traverses them is shown at *c*.

*a, a*, the two basilar processes of the phragmocone; *b*, the phragmocone, much fractured and collapsed; *c*, the rostrum or guard of the osselet, containing within the upper part the distal portion of the phragmocone, as seen in fig. 2.

2. *The Osselet* (fig. 1 *c*, fig. 2 *h, i*).—This body is in the form of a very elongated inverted cone, and surrounds the phragmocone throughout its entire length, as shown in section in fig. 2: the basilar or upper part is extremely thin, and blends with the outer integument or capsule (fig. 2 *b, b*): it rapidly increases in thickness as it descends, and closely invests the phragmocone, the delicate elongated apex of which is completely protected by it (fig. 2 *f, g*): beneath this point it becomes solid, and in most

Fig. 1.



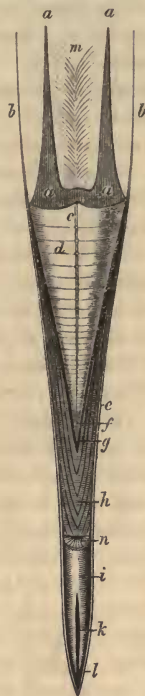
BELEMNITES PUZOSIANUS  
( $\frac{1}{4}$  natural size, linear).

species is prolonged into a cylindrical rostrum or beak, which terminates in a conical apex.

Fig. 2.

Diagram of the known parts of the structure of *Belemnites Puzosianus*.

- a, a*, the dorsal basilar processes of the phragmocone.  
*b, b*, upward extension of the attenuated osselet.  
*c*, siphunculus.  
*d*, phragmocone : the transverse lines indicate the septa.  
*e*, the capsule or outer investment of the guard.  
*f*, the distal part of the phragmocone.  
*g*, the alveolus or cavity in the guard.  
*h*, vertical section of the guard.  
*i*, the solid part of the rostrum.  
*k*, a sulcus or groove on the ventral aspect of the guard.  
*l*, shows the continuation of the capsule, in section, continued from *e*.  
*m*, diverging parallel striæ observable between the dorsal processes of the phragmocone.  
*n*, transverse section of half the diameter of the rostrum, to show its radiated structure.



As the solid part of the osselet is generally separated from the upper portion a short space above the apex of the phragmocone, in consequence of the thinness of its walls, the Belemnite is commonly found with a conical cavity in the upper part: this hollow was termed the alveolus, and the solid part the rostrum or guard; and until shown by the specimen figured in my first memoir on the Belemnites, no one suspected that the osselet was continued upwards, and formed a thin envelope around the basilar termination of the phragmocone\*.

The osselet of the Belemnite, as is well known, has a radiated structure: it is formed of thin concentric laminae of very minute prismatic trihedral fibres, which are arranged at right angles to the planes of the successive layers:—see the sections, both longitudinal and transverse, in fig. 2. The solid part, or rostrum, is

\* The depression observable in the specimen fig. 1, midway between the letters *b* and *c*, indicates the fracture of the walls of the osselet, and the point where the Belemnite is usually separated from the other parts. It was by removing large blocks of clay, with the imbedded Belemnites undisturbed, that the instructive examples here figured were obtained.

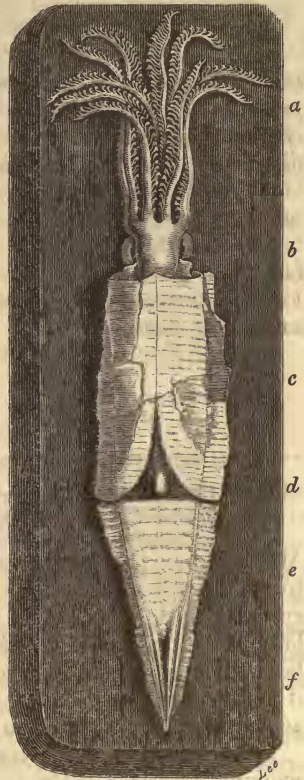
very thick and heavy, and invariably mineralized by calc spar : the original structure was probably light and calcareous, like that of the osselet of the *Sepia*.

3. *The Capsule*, or sheath; a thin horny or testaceous case which invested the osselet, and constituted the external envelope of the receptacle; it is seen partially covering the osselet at *c*, fig. 1, and in section at *e*, *l*, fig. 2. This structure was for the first time demonstrated in my memoir, 'Phil. Trans.' 1848.

With the exception of obscure indications of a carbonaceous fibrous structure between the dorsal processes, the above description comprehends all the facts relating to the organization of the Belemnite with which we are at present acquainted: no soft parts, no traces of arms or tentacles, no vestiges of the eyes or mandibles, have been discovered.

The BELEMNOTEUTHIS.—From the extraordinarily perfect state in which some examples of the *Belemnoteuthis* are met with, a brief description will suffice. Fig. 3 (from a drawing with which Mr. Woodward of the British Museum has favoured me) exemplifies the essential parts of the structure of these Cephalopods. The body is of an elongated form, with a pair of lateral fins, two large sessile eyes, eight uncinated arms, and a pair of armed tentacles; each arm was furnished with from twenty to forty pairs of hooks, placed alternately (fig. 4, 4). Like the *Sepia* it had a pigmental sac or ink-bag, which is generally filled with the inspissated secretion. The inferior part of the body is of a conical form, and contains a brown horny osselet, with a siphunculated phragmocone, which terminates in a rostrum of a fibrous structure (fig. 4, 5). The osselet of the

Fig. 3.



BELEMNOTEUTHIS ANTIQUUS  
( $\frac{1}{2}$  natural size, linear).

*a*, the uncinated arms and tentacles; *b*, remains of the head and eyes; *c*, the mantle, with indications of fins; *d*, the pigmental sac or ink-bag; *e*, the osselet: the transverse lines indicate the septa of the phragmocone, which is covered by a horny sheath or capsule; *f*, the solid terminal apex of the osselet.

*Belemnoteuthis* appears to have been calcareous, like that of the *Sepia*. In all essential points of structure the *Belemnoteuthis* is

- 1, 3. Detached hooks (*natural size*).
2. Three hooks with attached horny rings: from a specimen in the possession of Mr. Cunningham.
4. Part of one of the arms, showing four hooked spines.
5. Transverse section of the distal part of the osselet of *Belemnoteuthis*, exposing the apex of the chambered shell in the centre, surrounded by the radiated osselet, *a*: (*magnified four diameters*).

Fig. 4.



Horny rings and hooks of *Belemnoteuthis antiquus*.

related to the Calamaries, but the lateral position of the fins, the presence of a chambered shell or phragmocone, and the peculiar character of the tentacles, establish it as a peculiar type. The distinction between the *Belemnites* and *Belemnoteuthis* is too obvious to demand further notice; no one, I presume, will again mistake an osselet of the latter for the phragmocone of the former detached from the alveolus of its guard: and I would fain hope that this attempt to elucidate an important palæontological question, will not again subject me to the imputation of unamiable motives.

I have the honour to be, Gentlemen, your faithful servant,  
 Chester Square, Pimlico, GIDEON ALGERNON MANTELL.  
 June 1852.

III.—On a supposed new species of *Eleocharis*. By CHARLES C. BABINGTON, M.A., F.R.S. &c.\*

My attention has been recently directed by Mr. H. C. Watson to the British species of *Eleocharis*, and, having been led to concur with him in the idea that there is an undescribed plant belonging to that genus which inhabits the western coast of Scotland, I purpose pointing out in this paper the respects in which it differs from our known species included in the genus, and adding a few remarks upon them.

In the autumn of the year 1844, I had the pleasure of accompanying Professor Balfour of Edinburgh in a tour through the district of Cantyre in Argyleshire. At Tayanloan, on the western coast of that peninsula, he gathered two or three specimens of the plant upon which this paper is founded, but did not observe its difference from *Scirpus pauciflorus*, in company with which it

\* Read before the Botanical Society of Edinburgh, June 10, 1852.